

MLS tropospheric O₃ validation

AVE Houston 2004+2005, O₃ sondes

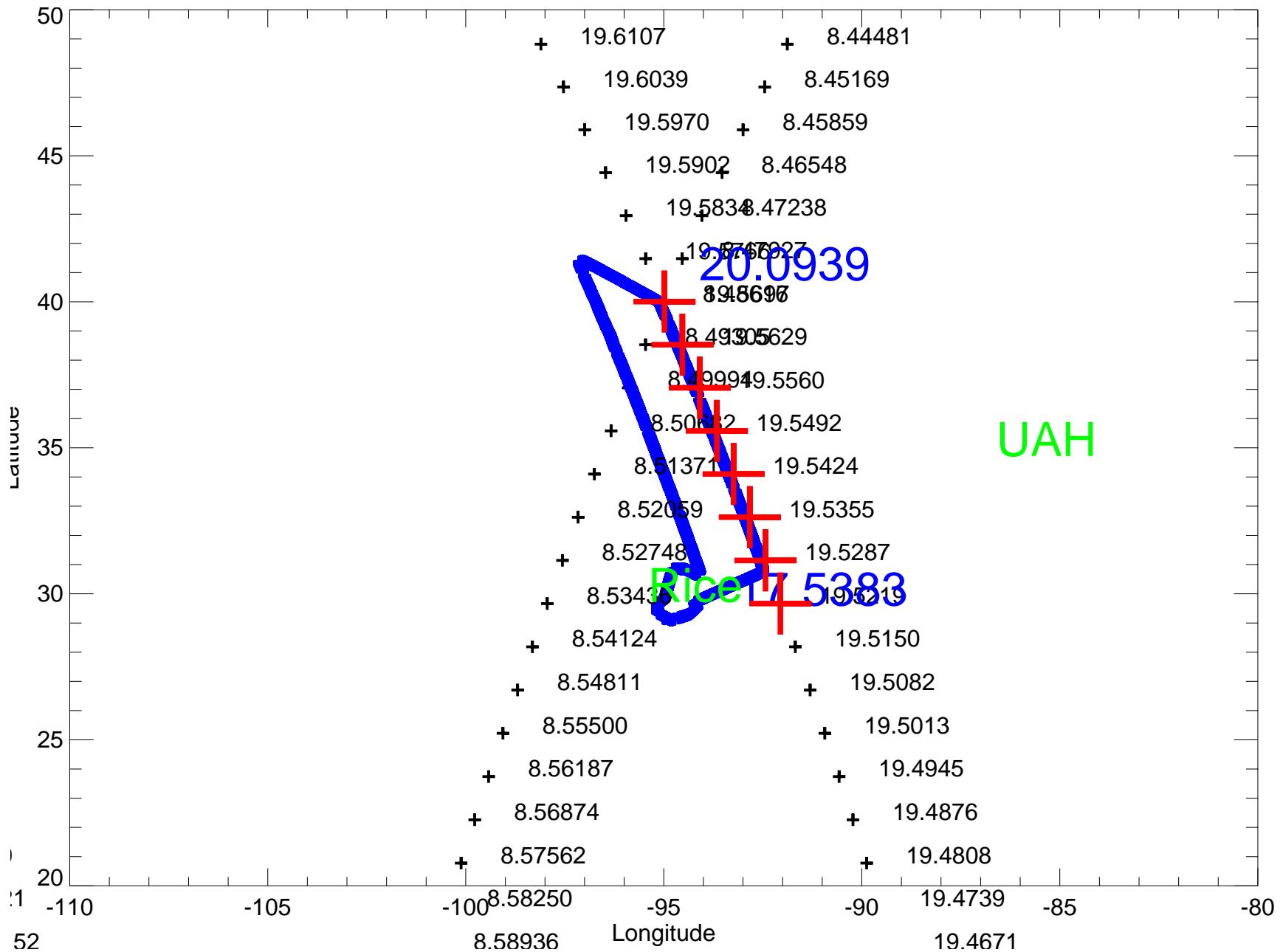
Mark Filipiak

MLS tropospheric O3 validation

AVE Houston 2004+2005

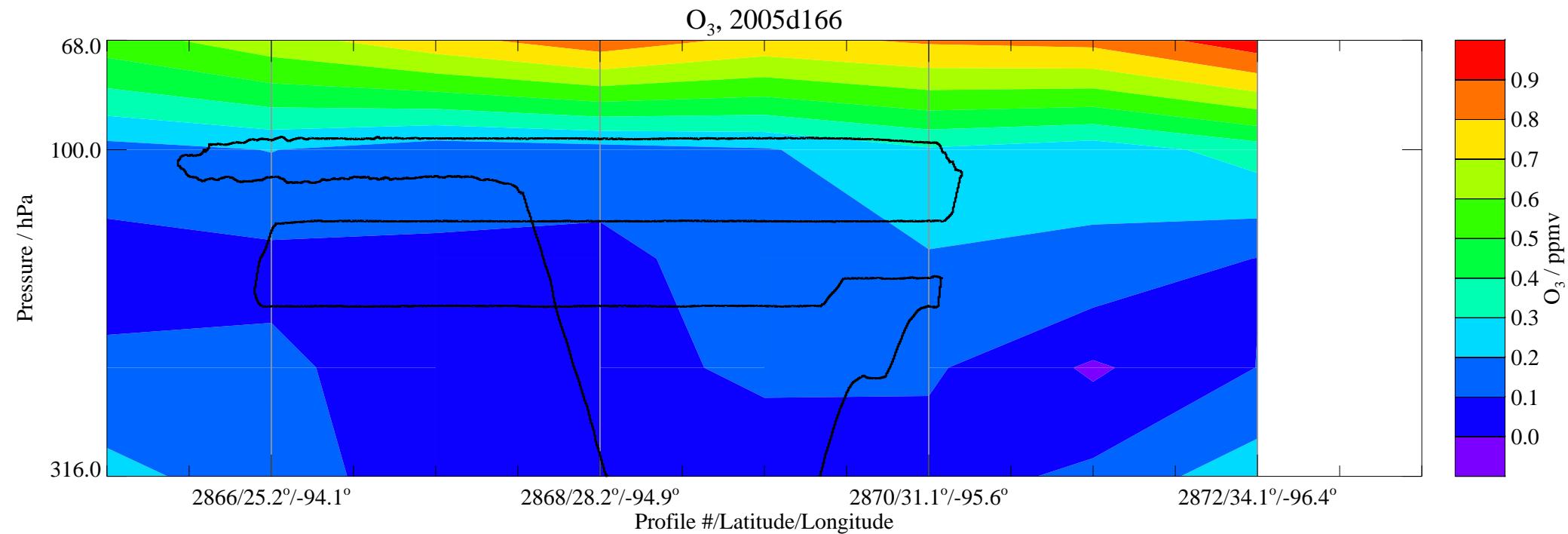
- AVE Houston (WB-57) flights sample mainly the troposphere (PAVE mainly stratosphere, still to be analysed for tropospheric O₃).
- O₃ measured by one in-situ instrument: NOAA photometer.
- Flight paths were chosen along/near MLS track.

AVE Houston 2004+2005, typical flight/MLS track



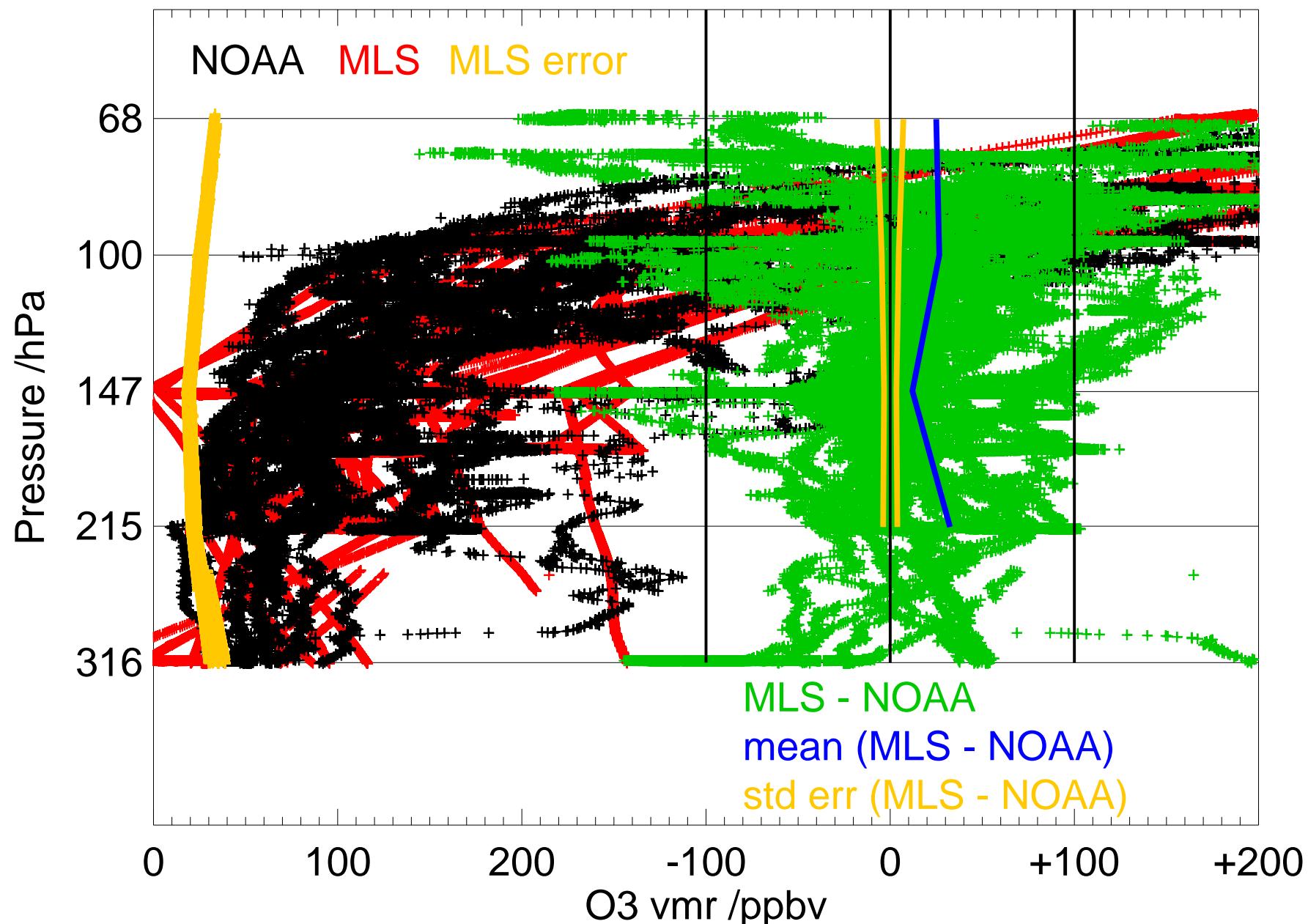
- Coincidences chosen for measurements close ($\sim 0.2^\circ$ longitude) to MLS track. Time coincidence ± 2 hours.
- WB-57 track, coincident MLS profile positions. (UT of MLS profiles , WB-57 start and half-way points.)

AVE Houston 2004+2005, typical flight/MLS cross-section



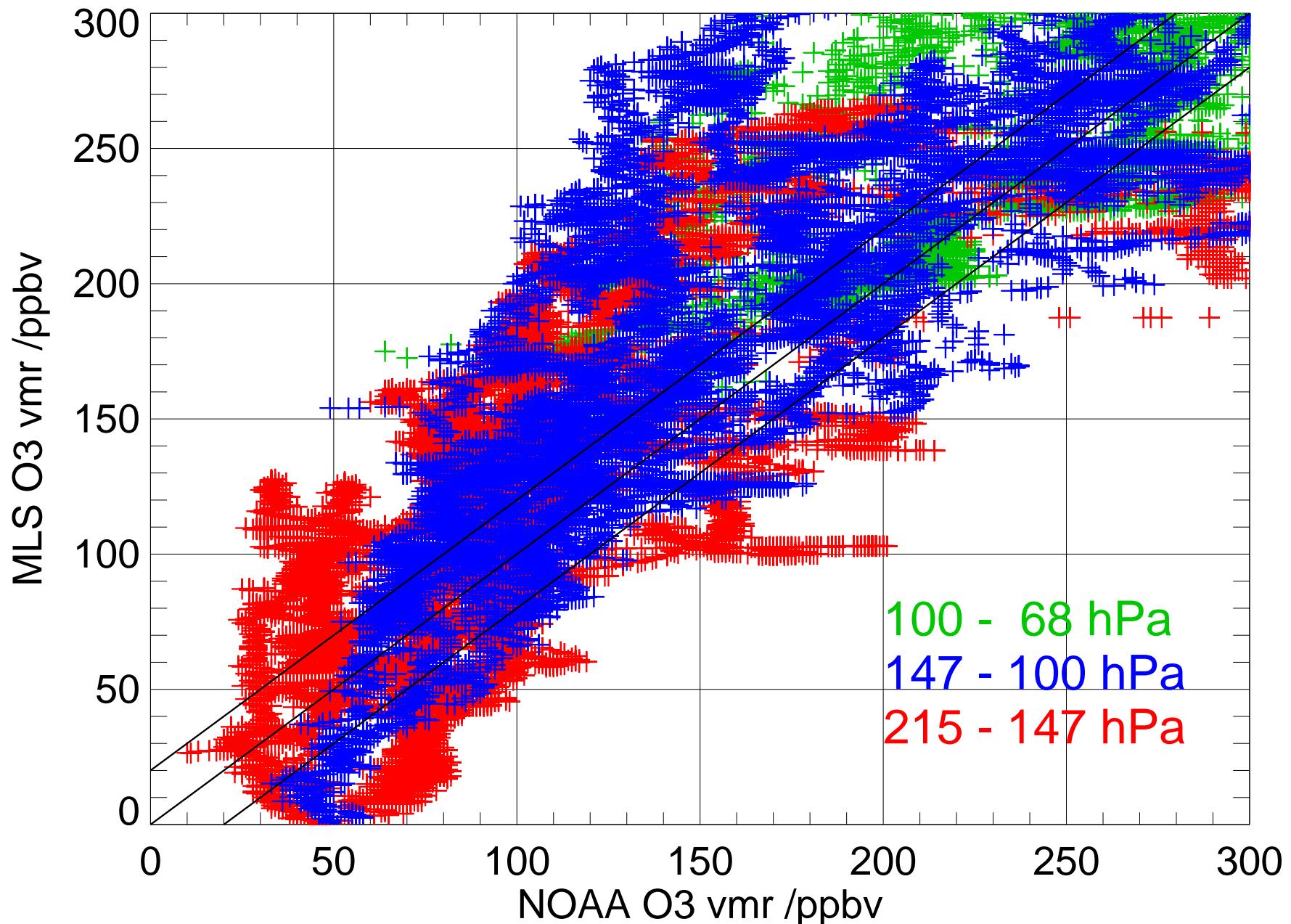
- Flight path along the curtain of MLS profiles.
- Compare in-situ data with bi-linearly interpolated MLS data.

AVE Houston 2004+2005 O₃ (MLS, NOAA)



- MLS below 215 hPa not useful in current version (V1.5).
- NOAA error $\sim 5\%$, std err dominated by MLS.
- MLS has positive bias (in fact, $\sim 1.25 \times$ scaling error, see next slide) and large scatter.

AVE Houston 2004+2005 O₃ (MLS, NOAA)



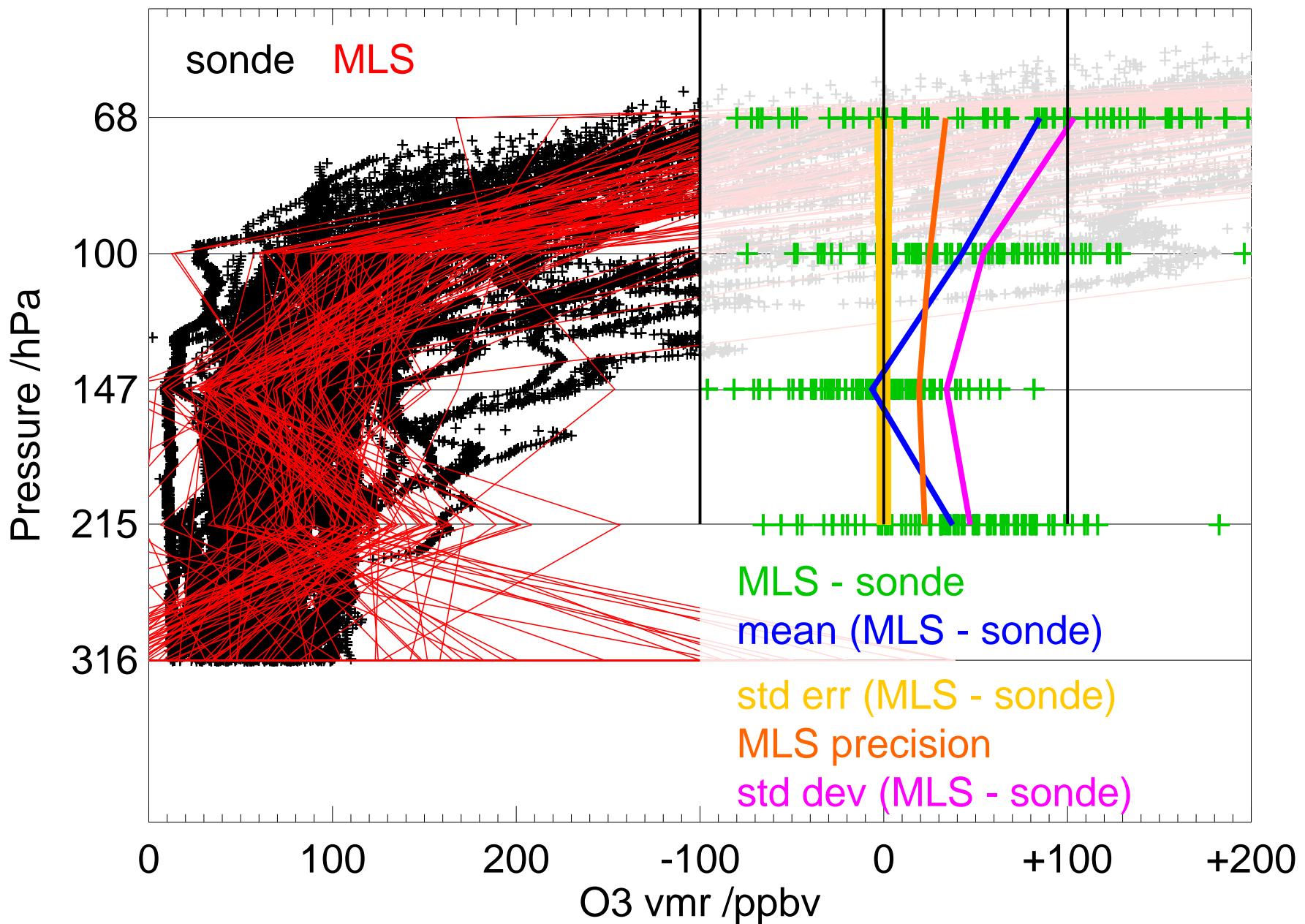
- MLS has $\sim 1.25 \times$ scaling error.
- MLS possibly has a ~ -50 ppbv bias as well as the scaling error.

MLS tropospheric O₃ validation

Sondes 2004+2005

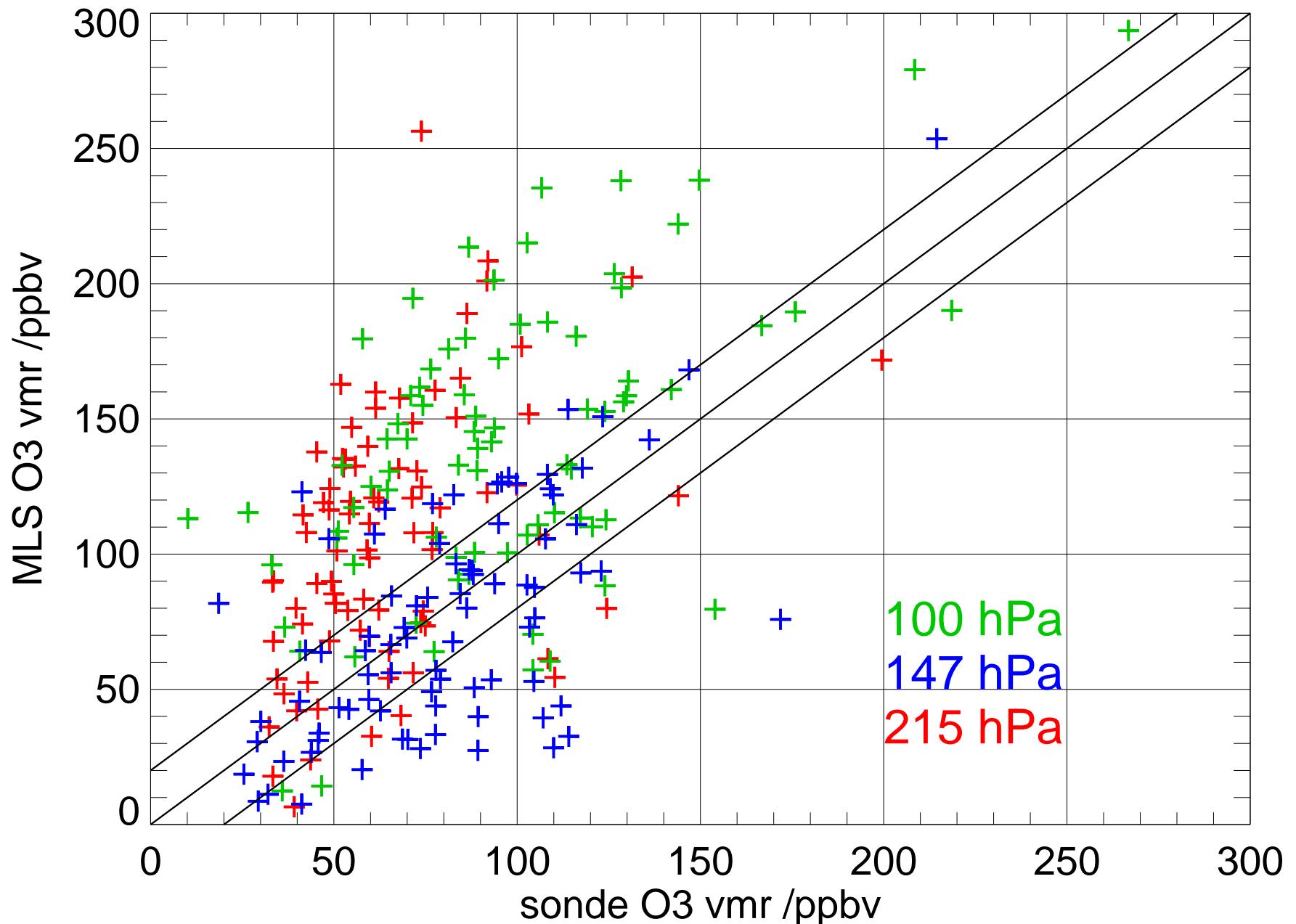
- Tropics/sub-tropics only (lower limit for MLS O₃ is currently 215 hPa): SHADOZ, Houston, Huntsville.
- ~ 100 coincidences within 1° latitude, 3° longitude, 4 hours time.

2004+2005 O3 (MLS, sondes)



- MLS generally has a positive bias, and oscillations.
- Scatter is $\sim 2\times$ estimated uncertainty, similar to simulation results.

2004+2005 O3 (MLS, sondes)



- The 215 and 100 hPa data show similar behaviour to the AVE NOAA data, but the 147 hPa data does not show a scaling error.

Summary

- AVE flights/sondes and SHADOZ sondes have provided very useful validation data for MLS upper tropospheric ozone.
- They show that MLS is measuring $\sim 1.25 \times$ too high, with possibly a ~ -50 ppbv bias.
- Scatter in MLS is $\sim 2 \times$ the estimated MLS uncertainty.
- Work on UT O₃ for version 2 of the MLS retrieval will concentrate on understanding the source of the excess scatter.